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THE DEVELOPMENT OF A SUCCESSFUL TELEMEDICINE NETWORK WITHIN A MANAGED CARE ORGANIZATION*

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It is a great pleasure to be here. I don't come from Washington; I actually come from rural North Dakota, so I've had a wonderful time for the past twenty-four hours visiting with old friends and rehashing some of the distant past. I can tell you that my interest in telemedicine stems from my North Dakota experience. To my surprise, my career, some thirty years long now, really centers around rural health care delivery.

I practiced in Langdon, North Dakota, for fourteen years and then was the Associate Dean of Medical School at the University of North Dakota for a decade, trying to train young physicians for rural or regional health. Quite frankly, I'm a little astonished to find myself at the business end of medicine in a large corporation. However, it pleases me that my responsibilities still lie in the area of rural health, and it is that interest which has drawn me to telemedicine. I am absolutely convinced, even prepared to bet the last third of my career, on the fact that telemedicine is the way we are going to do business.

I have listened to the problems associated with rural health and have heard them stated and restated for thirty years. In fact, I stopped going to the American Rural Health Association meetings after the first decade because I felt that they had made their points. I knew that physicians in rural America were aging; that it was difficult to recruit; that it was difficult to retain; and that it was difficult for patients to access care. What I didn't hear at any time was a solution to those problems, and if the solution came along, it was invariably a very regional solution. Because of the work of some individual, things would get better in one small area, but I think the potential of telemedicine is almost universal.

As I talk technology, perhaps I can tell you one story that I think is rather cute. I've been thinking about my daughter; she's getting married next week. I have three daughters, and they have been going through my mind a lot, as has all of this technology. This is the story of the father who had been struggling mightily with his adolescent daughter. They had a major disagreement over the sound at which the stereo should be played in the house. She was convinced, of course, that it should properly be played at maximum volume. He, on the other hand,

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thought it should be played somewhat quieter. They were both convinced that the other had faulty hearing, which was the cause of the dispute.

The father came home one day, through the garage and kitchen, to the back of the family room. The stereo was playing at about 150 decibels. The music was unintelligible to the average mind. The father stood at the back of the room and said, "Janet, it's your father, can you hear me?" And there was nothing. He thought, "This just proves it," and he walked halfway towards her, coming up from behind, and again bellowed out, "Janet, it's your dad, can you hear me?" Then he thought, "This is it," and he walked directly up behind her and really bellowed "Janet, this is your father, can you hear me?" She turned around and said, "For the third time, Dad, I hear you." So you can draw your own conclusions on that.

Well, I've told you a little about my background. Let me tell you a little about Allina, the corporation for whom I work, because I think it's relevant to what I have to say today. It's a large corporation, and I have two things I'm interested in showing you. I started with Health One Corporation in about 1988 or 1989; it was a health care delivery company about $500 million strong, and we merged in 1989 with Life Span, also about $500 million strong. This is where my first lesson in corporate economics came along. We put these two organizations together and we were struggling for a name. We couldn't decide on one, so we brought in a very high priced consultant from New York who went to the mountain, charged us a substantial amount of money and said, "Health One, Life Span; clearly you should be Health Span." So the consulting business is open to all of us if things get desperate.

About the same time, Medica Health Maintenance Organization in Minnesota was changing; we were being driven a little bit by state politics. It looked as if the state was going to mandate a greater degree of integration. The state represented another billion dollars, and it seemed wise to merge so we did. The only reason the merger is significant to my story is that this now billion dollar health maintenance organization decided that telemedicine was of interest. When we decided to go into the telemedicine business, our insurance branch said, "We will pay for telemedicine consultations."

That was both a plus and a minus. We have about a million members in our health plan, which sounds great on the surface. Unfortunately, the million members are almost all in the metropolitan area, so the people that I would like to link up and supply with telemedicine consultations paid for by using insurance dollars, actually were not going to access the system. There is not much point in using tele-

medicine if you live in the Twin Cities. But it sentineled to us that this was one of the things we could use as a marketing strategy, and we are beginning to do so.

In the past, at least in Minnesota and in many other states, the rural part of states have been ceded to the Blues—Blue Shield and Blue Cross. We are not going to proceed that way in Minnesota anymore. We had planned to challenge the Blues greatly for business, and our growth is going to be in the rural areas. The metropolitan market is pretty much divided, so if there is a measure of altruism in my interest in telemedicine, there is also certainly a great interest in the practical end of it.

That brings me to Dr. Dena Puskin. You were fortunate, in my mind, to have the chance to listen to Dena. She is one of the most articulate, knowledgeable people in this country about telemedicine; where it is, where it's going, and how the Congress feels about it. And she gave you, I think, as good an overview of telemedicine as you are going to get.

On the other hand, I am going to try and give you briefly a very pragmatic view of telemedicine. I'm less interested in legislation and licensure, and the like, although I'll talk a little bit about it. What I'm most interested in is whether or not I can practically put together a system that will serve rural people and will do so in a cost-effective manner, or in a manner that our health care organization is prepared to sustain. I think I can do that.

We're a big organization; we do three billion dollars worth of business a year, and we operate on the same margin as a good grocery store. We look for about a three percent margin—I guess I can't call it profit, because we're not for profit, but if you're not making money, you're not going to be around as a nonprofit for very long.

We have four principle areas in which we function; and again this ties in with our interest in developing a network. I come from the health care delivery side of the organization. We have seventeen hospitals, four of them are urban and the rest are rural, that we either own or manage. We also have a provider division. We employ 400 plus physicians, probably closer to 450 now, and we're trying not to hire any more physicians for reasons that we can discuss later. Our productivity drops dramatically as we become employees rather than entrepreneurs.

But we have the delivery system; we have the providers; and then we have, as a third piece of this, a large and growing health maintenance organization. We also sell insurance that ranges from commercial insurance down to a tightly managed health maintenance plan. So we offer a range of services. Finally, we have a large diversified services division. We have the largest transportation, fixed wing aircraft ambu-

lance system in the state of Minnesota, as well as home health care, oxygen, printing businesses, and the like, all of which are allied.

We would like to think that we are an integrated health care system. In fact, we are not, but we struggle daily with trying to be integrated. We very clearly still have silos within our organization. These four areas have difficulty thinking about a bottom line, and tend to think about their own segment of the business, which makes life difficult. Nevertheless, moving toward more integration is what is driving us. Partly our size and partly the presence of an insurance wing, to me, made the development of the telemedicine network almost natural.

Let me quickly lead you through the development of our network. What I would like to do, by way of overview, is show you the network, tell you what it does, what I think makes it tick, and talk to you a little bit about the economics involved, because that's incredibly important to me. Then I will talk a little about the future and where the problems lie. I think you will see something of a sameness as I talk about the future and the problems ahead, compared to what you have heard from Dena and from others. Whether it's a local perspective or a national perspective, many of the problems are the same.

There are some sharp differences, however, between the way Dena perceives things and the way some of my colleagues from Bismarck, North Dakota, and other parts of the country see things. We all have a different twist on telemedicine when it comes down to applying it.

We started our network in January of early 1995. We had about a year and a half of planning involved and we started it with funds that really came from Dena's office.[1] Another lesson I learned is that grant writing is not my forte. I participated in writing a grant to the federal government, to the REA. It was, in my mind, a very well-written grant. I was invited by the REA, before the grant awards were announced, to speak nationally on how to write grants to the REA, and I took that as a fairly positive sign. I had asked for $640,000 to equip eight sites, and I was busy spending my money.

The REA thanked me for telling people exactly how to write grants. In September of that year, they awarded the grants and didn't give me any money. I backed off, had other people write the grant, and we were successful in receiving $640,000 to buy equipment for eight rural sites. What Allina, who was Health Span or Health One at the time, committed to was acting as the urban hub if these dollars were awarded. Allina asked for no money, and never has asked for money to run the network; our network is self sustaining.

1. Editor's Note: Dr. Dena Puskin is the Acting Director of the Federal Office of Rural Health Policy in Rockville, Maryland.

But we had asked for dollars on two occasions to buy start-up equipment for small communities that could otherwise probably not afford it. We received the funds, and the first group that came on line was Elbow Lake, Alexandria, and Sauk Center, Minnesota.

Three months later, we began to bring more sites on line. At the end of the year, we were up to about eighteen. As of the end of this month, we now are at twenty-eight sites; seven of them urban and twenty-one rural, and we will add a couple more sites over the next two or three months. The last grant that we received to add six sites came from US West Corporation and was administered by the Department of Communication in Minnesota.

It is interesting to go back to some of the things that Dena said. US West is putting the very best face on that they can. They were actually fined four and a half million dollars for overcharging, but have altruistically put their fine up and said, "We will put a million plus of this in medicine, a million plus in education, K through 12, and a million plus in services." We applied for a million two of this money, almost all of the money, and we received a million dollars.

In fact, again as an aside, I can tell you that about two weeks ago I got an ordinary looking letter in the mail, and I get tons of that stuff, all of us do these days. This looked like one more piece of junk mail. I pulled the perforations off the side and almost chucked it, but it said US West in the corner. I pulled the perforations, pulled this thing out, and it was the initial payment for $863,000 drawn on a bank in Colorado. So be careful with your junk mail.

At any rate, that equipment, or that money from US West, goes to equip eight more small sites within the state, and it puts a different twist on what we have been doing. We asked for money to be in three categories; interactive video, and I'll talk more about that, diagnostic radiology, and medical peripherals. It's the diagnostic radiology which is a new twist for us, and I think it merits a brief explanation.

When Dena and others say to you that there has been much teleradiology over the past several years, that's true, but I think it's incomplete. Our radiologists at Abbott Northwestern Hospital are reading images from seven states right now, and they plan to expand that. But the images that they've been reading have been coming in over plain old telephone service, and they're not diagnostic. They'll give an opinion on the basis of the image, but their diagnosis will be rendered when a hard copy follows.

The American College of Radiology is the first specialty that has put standards in place for what they require to make a diagnosis and they're very different for ordinary interactive video. The resolution that

we use in our system and that you use to watch the evening news is 640 lines by 480 pixels, or picture elements, going across your screen. It works fine for television, but for a diagnosis by a radiologist, we need 2K or two thousand lines by two thousand pixels, a huge difference. And you can see the reason why, if you think about it.

Oftentimes when I'm going to a demonstration, I'm wearing a sports jacket that has a herring bone or a tweed or something in it, and when you look at my image on the television screen, I'm wearing a gray jacket or a brown jacket; the tweed or herring bone is lost. It makes no difference as far as my jacket is concerned, but if we're looking at a mammogram or if we're looking at a chest X-ray where there is a subtle infiltrator image that disappears because of the compression, that's going to have the legal profession—the bad side of the legal profession, that is, the people that oppose me—looking at that, and I think, having a heyday with the sin of omission. So we're very wary of that.

I'd like to talk specifically about what we use in our network now, having told you what the network looks like. As far as hardware and software is concerned, there are a number of different manufacturers on the market, and they're becoming very competitive. We selected an organization called V-tel some time ago, and I'm pleased with their service, although other people, like Picture-tel and CLI, are in the process of merging right now with V-tel.

The hardware to set up a room costs somewhere in the neighborhood of $50,000 to $80,000. When I first started this and made an application to Dena's office, we were estimating $100,000 a room. That price is falling. It's still substantial, but we are moving rapidly towards desktop equipment where there is a dramatic difference in price. We're not talking $50,000, we're then talking $4000 or $5000 for state of the art equipment, including both the PC and the software to drive it.

The other hardware we're using is ICON equipment. There are a smaller number of manufacturers, but still several who are in the business of making diagnostic teleradiological equipment. I've already mentioned to you that the screen needs to be 2K by 2K, but the equipment also consists of something to scan images. They take the analog picture, that good old X-ray film that you're accustomed to seeing, scan it to digitalize it, store it, and forward it. Now we're talking the store and forward sort of telemedicine of the future.

The infrastructure that we're using is dedicated T1 lines. You've heard much about that, and I'll talk a little bit more about it when I talk about problems. It's the most expensive part of what we're doing, and it's the crusher in the sense that, despite the work that's happening in

Congress, the most distant, small community, really the one I would like to help the most, is the one who has the absolute worst sort of T1 cost.

The people who are putting infrastructure in are under pressure, not enough, as far as I'm concerned, but they are under pressure to change it. Let me give you an example. I did a demonstration of telemedicine in a community in Hutchinson, Minnesota, where they were about to implement telemedicine. In coming on line, we connected using a bundle of integrated service digital network (ISDN) lines. We used four of these lines to give us the equivalent of a half T1, which is what we normally use. The cost for those T1 lines is $40 a piece per month. So Hutchinson can have telemedicine for $160 a month and some relatively insignificant long distance charges.

Seventeen miles away is the community of Litchfield, Minnesota, where a grant is putting in the equipment. There is not ISDN in Litchfield, so they are purchasing a dedicated T1 line. Their T1 line is $1400 a month. These communities are seventeen miles apart; they're going to get exactly the same service from us, one of them is $160 dollars a month—let's round it out to $200, the other is $1400. This difference is because ISDN is not available; and is not going to be available in small communities without some other driver. The copper for all of these things, or the fiber, is the same. It's the switch that makes the difference. It's the connection; it's how the communications company handles these lines, and switches are seventy, eighty, or one hundred thousand dollars.

So you tell me how much interest you think US West or AT&T has in putting those switches into a tiny little community—not much. In fact, I don't want to be in the communications business at all, and when I round out this talk I'll come back to that. It's one of the biggest thorns in my side.

As we hit thirty sites, we're running a small telephone company. When you pick up your telephone, you punch in a number and you expect to be connected to someplace else. You don't care whether it goes out to the moon on a satellite or halfway around the country and comes in the back door, as long as you are reliably, quickly, and economically connected with the site you wanted.

As soon as I'm talking broad band, the communications industry says, "We'll rent you or sell you these lines. There they are, have a nice day. What you do with them and how you connect them is your business because we haven't got the equipment to do so."

We're looking right now, and I'm getting ahead of myself, but we're looking at changing companies for our hardware. There is another company bargaining with me right now saying, "We'll buy back all the equipment you have if you'll put ours in, and we'll lease it to

you, and we'll provide the infrastructure. We'll do all the networking." That's attractive; it could change things dramatically for me, so we're looking at it very seriously. The point, again, is that the infrastructure is pricey and it's one of the biggest headaches I have.

You saw medical peripherals, I think, demonstrated yesterday. My colleagues in Bismarck, North Dakota, said they didn't think they needed many of them. I would disagree strongly. I couldn't run what we're doing without a stethoscope, or without at least a notoscope. We use the opthalmoscope and dermascope less, but we would not consider doing this without a stethoscope.

You see, I'm not consulting physician to physician very often. I don't see a great future in that. I'm going from remote physician to patient, which is very economical. It's very threatening to some people, but it's where our business has been expanding the most rapidly, where we've been getting rave reviews, and where we've been getting people coming to see our system and paying money.

As a side business, we're charging $4500 for a day seminar now. We have had people from Japan, Norway, Israel, and multiple sites around the country, coming in to see how to do tele-emergency medicine. My staff grabbed the money and figured out how to spend it on telemedicine.

At any rate, we're standardizing our medical peripherals so that we don't have a mixed batch. They're very important to me. We're also looking for economy. We're buying a stethoscope now that's made in the Twin Cities that's a quarter of the price of most of the others; it's about $2500. Our cardiologists think it's just fine, so we're looking for that type of thing. And for the other peripherals, we buy one camera, with all the attachments that go on the end, so that we don't have to be doing all of this.

I have twenty-eight sites and growing right now, and I have physicians and nurses, or physicians and physicians, who aren't getting along because they don't know each other, haven't worked with each other, and don't trust each other. If I have equipment that's not working, it usually is not because of the network or because of the hardware, but because we haven't got people trained at each end to use it.

For an example, in the emergency medicine piece, the physicians at our hub discovered that they can move the cameras remotely, and of course think they can do it better than nurses; that's obvious, I mean, they're physicians. The physicians, therefore, when the nurse is moving quite rapidly to do this, know that they can do it faster, so they move it. Unfortunately as they start out, the nurse is moving the camera to the right, the physician is moving the camera to the left, and neither of them

are quite sure which way the button will take it. The next thing that happens is the camera locks up and the physician, of course, says, "What the hell did you do?" And the nurse says, "Pardon me?"

The point is that the system is now not functioning, not because of any problem other than the fact that we did not have good communication between the two people. They got themselves in a position and they don't know how to extract themselves from it. As a result, we'll spend an hour having them find somebody at two o'clock in the morning who can very quickly say, "Fine, just hit Alt F7, something like that, because this is user friendly." If you believe that line, I'll sell you a few things while I'm here.

Part of the problem with all of this equipment, and for that matter, with all computers, is that all these young kids that grew up playing Nintendo tell me it's user friendly, and they come in, punch a few keys, and everything happens. None of that happens for me, particularly if I'm stressed; if I'm trying do a consultation, if I'm trying to give a talk, or if I have my mind on other things and it starts heading south, it's not user friendly. I think we've got a long way to go to make it user friendly.

I expect two more sites this year; and I expect ten or fifteen percent annual growth on our network. By that I mean I expect to see three or four sites coming on a year. On your second day of this seminar, this is getting to be old hat, but let me talk about it fairly specifically.

Consultations. I would break consultations down into at least three areas. First, there are teleradiological consultations. They are growing rapidly and the impediments to their growth are physicians. Half of radiologists want the door opened wide because they see a huge business opportunity. The other half want the door kept absolutely shut because they see impending doom. They're both correct, of course.

My daughter, my middle daughter, the one not getting married this week, is graduating from medical school this year. I have long been wary of her asking me for advice as to what she might do with her career because I don't know. I thought I knew a while ago, but my advice to her right now has been, "You better be good at what you decide to do because the system is not going to tolerate incompetence; and you better not pick your specialty on the basis of what you think the economic situation is, because, as the question goes in California right now; what is the difference between an orthopedic surgeon and a sea gull? And the answer is, the sea gull can still make a deposit on a Lexus."

There are more orthopods, anesthesiologists, radiologists, and other ologists around than society needs. It is depressing for forty-five year old physicians to find out that somebody changed the rules. They're good people, and knew that if they worked hard, the sky was the limit as

far as their income was concerned. But society has re-evaluated their worth. So my daughter had decided she's doing family practice, and I hope that's a good decision, but I'm not sure about that either.

Back to consultations; radiology is a done deal because it's reimbursed. The second area that is working out very well in consultations is tele-emergency medicine, which I'll focus on in just a moment. We have now done about a thousand consultations. We are doing about ten consultations a night, and more on the weekends. The patient satisfaction, as I will show you, is superb. The problem is, as always, providers. We can talk a little bit about that. I think these types of consultations are one of the ways that we're going to do rural emergency medicine. I'll focus on that example in a minute because I think it's important and I want to come back to it.

The third area of consultation is general medical consultations. This area is growing slowly. Our growth happened to occur most commonly in psychiatry, followed by cardiology, followed by oncology, followed by all of the other ologies in small amounts. Initially, I thought the principal problem with growth in the general consultations was reimbursement, but that's not the major problem, it's the second problem. The first problem is convenience, and that's why we're moving to desktop.

I was initially prepared to criticize my colleagues because I thought they were too lazy to walk across campus to do a consultation, but it's not really that. If you think about it for a moment, I'm accustomed to seeing my patients by going from room A to room B to room A, and while I'm in room A, room B is being set up, and the like. When I walk into the room, I pick the chart off the door, I'm comfortable, familiar; I do my consultation, I dictate my note, I hand the chart back to my assistant, the billing process commences and everything flows.

No matter what I do to try and make telemedicine consults easy nothing has worked so far. I've tried having the physician go down to the telemedicine room in another part of the building, but none of the things are there, so I disrupt the flow. The result is if they do the consultations, the physicians want to do them at seven in the morning or at a quarter to twelve, or at one o'clock or at five o'clock. In other words, they'll do it before they go in, when they're leaving, but they sure don't want it during the day because it makes them less productive.

On the other hand, there is something that is counter-intuitive to me: I find that I have more specialists who are prepared to do telemedicine. The reason, I think, is that their incomes are falling. We've had many ologists; cardiologists, oncologists, and the others, who have set their trap lines. They've gone to all the surrounding small towns to see patients,

providing good service, good business, good insight, and good referrals into urban hospitals. But now, as managed care permeates their practices, we're saying to them, "Sorry, it was eighty percent last year that we reimbursed, but we're paying forty percent for your consults this year. Have a nice day." These specialists are determined, and I think it's not unreasonable, to try and maintain their incomes at the level that they're accustomed to.

Hopping in their car with all the windshield time to go out to the small town is not productive for them. So they're saying to us, "We'll continue doing those consults at the forty percent, and don't forget, we reimburse. We'll do them at the forty percent, but we're not driving out there anymore. We want to do them in the office, bang, bang, bang." As a result, we're starting our first desktop telemedicine in our cardiologist's office and we're going to link them to a variety of sites. That's our consultation business, and I can talk a little more about that.

Education. And by the way, it's important to me that you understand that for my telemedicine network to work, these are all integral. I don't want to build my network on any one of these because it depends on all of them. The further out people are, the more valuable consultation becomes. If I have a hospital that's fifteen miles from the center of Minneapolis that's got telemedicine, do you think somebody wants to do a cardiology consult there? I'll tell you they don't.

Do you think that they want to have the physicians doing their medical education there? Maybe, but I'll tell you who does want to do their education there, big time, the technologists and the nurses, which is where we're focusing our attention now. In small town Minnesota, there are probably two technologists on the staff of the local hospital. In order to maintain accreditation, they have to demonstrate continuing medical education (CME). In order to get CME, the administrator pays them to go to Minneapolis or St. Cloud or someplace else—pays the transportation, pays the per diem, pays the registration fee, and then no one is left to look after the hospital when everyone is gone.

Now these technologists can get the same CMEs that other technologists are getting in the urban hospitals. In fact, most of our urban technologists are getting their CME off a satellite. There's two or three centers in the country that do a lot of technology education. People come into the auditorium like this, watch a speaker on the screen, and reply by a 1-800 number. We're just compressing that and pumping it out on the network. People are using the same 1-800 number, and get the same CME opportunity as anybody else in the city.

We're doing the same with nurses. We've had some very successful community education programs, which are terrific marketing tools for

us. The last one we did was on breast cancer, where we had about fifteen sites with about thirty women attending at each site. We linked them with surgeons, oncologists, reconstructive surgeons, hospice, mammographers, and the like, who did their presentations and the nurses had a chance to interactively ask questions. When it was time to quit, we found that though we had run the seminar for two hours, we could have run it for four because the questions just didn't stop. These opportunities change the image and the value of a tiny hospital in the community. It's a citizen; it's providing information, not someplace where you go to check out. For us, it's great advertising and provides a public service, which are both things we want to do as a not-for-profit system.

Administration. Administration would eat our entire network if we let it. If no one else sees value in this technology, our administrators do and have seen it from the very beginning. At Morris Hospital, which is a four and a half hour drive from the Twin Cities, we used to bring our CEOs and chief financial officers in for business meetings at least once a month, sometimes twice a month. We often bring our lead physicians and our nurses together as well. However, they are not driving anymore.

Every once in a while they still drive in. I don't know who I heard say it, but there is value in face-to-face meetings sometimes, no matter how you cut it. But most often, people far prefer to stay at home, and we get far better attendance. I have an advisory committee that determines what takes precedence, and we made it clear that those things medical take precedence over administration, or the administrators would use this all day.

We don't send our information systems (IS) people out into the country now, we do it by telemedicine. When we're dealing with a new employee and people from the employee assistance programs, we do it over telemedicine. That's important to me and clearly an area where I can demonstrate savings.

The other piece that has been very interesting to watch occurred in the city. What's happening with our meetings now is that most people with a 7:30 meeting, and there's a lot of them in Allina, are going to the hospital closest to them, which I do regularly. I live north of the Twin Cities; Mercy Hospital is fifteen minutes from my house. Three days out of the week, I'll begin my day by going to Mercy to attend the meeting that's going on at the corporate office. All of our urban hospitals are linked and there's people all over the city at the meeting. When the meeting is over at 8:30 or 9:00 o'clock, and the freeway congestion is diminished, I take the freeway down and I save a huge amount of time. Our Vice President for Medical Affairs in the city no longer comes to

the corporate office for meetings, spending an hour each way getting there. Each person attends from their individual site.

Finally, we use the network for community service. We periodically have donated the network to the Multiple Sclerosis Society, Lutheran Social Services, Family Physicians, and the like.

Of the three things that drive telemedicine; provider acceptance is the key. I'll show you some patient satisfaction data that we collected. Patients are a non-issue, as Dena mentioned. They are very important, but they're a non-issue in the sense of acceptance; they accept it. It's the providers that don't accept it. In fact, the biggest impediment to telemedicine that I can think of is physicians; absolutely the biggest. And much of the impediment is self-interest and protectionism. We are being stressed to the max already as physicians. Society is changing its perspective of us and changing our image. We don't control our profession very well anymore. The control comes from outside; from industry, from government, from health maintenance organizations, and my generation is having a terrible time dealing with that. For my daughters, that's the way it's going to be, but in my generation, we're in transition and we don't like it very much. So anything that adds to this uncertainty scares us.

I'd like to talk economics for a minute, and I'd like to talk about our investment, costs, and income savings potential. First our investment; we, as an organization, have two plus million dollars invested in this. Our network is now probably worth four million dollars, including the equipment from other sites. We are spending in excess of $600,000 a year to maintain the network. Remember, we're a two billion dollar organization with three billion dollars in revenue, so that's not such a big bite. But it's big enough that about eight months ago, we decided as a corporation that we needed to look at this very carefully. Many of my friends were convinced that I had deliberately used subterfuge to raise the funds to build the telemedicine network. There was a little here and a little there and nobody knew how much the network cost. That's not the way I designed it, but I didn't mind having it develop that way because I want to do telemedicine. From my point of view, I wanted to do telemedicine, regardless of the cost. I think it's the right thing to do. But that's not the way business functions, so we ended up doing about an eight-month review. We had our attorneys, our business development people, our end users, and more people with their nose in this than I care to think about.

The risk for me and my personal involvement was that this would be perceived as of little value and great expense, and "we're glad Goodall had a good time, but we're turning the water off." On the other hand, it

was clear that I could not expect to get substantially more money and grow the network unless it was something the corporation looked at and bought into. Well, I'm happy to report to you that we looked at it and decided it was good business, that it was an excellent marketing tool, that we were saving money in some areas with it, that it was a way that we could distinguish ourselves from our competitors, and that we would continue to grow the network.

Some of the changes we would make would be to centralize it, develop a hard budget for it, and tighten the accountability. I didn't like some of these, but I bought in to telemedicine on the basis that these things would eventually have to occur. As we go forward, I have better support now and a better budget than I've ever had before.

Let me talk specifically about costs as we go on. I mentioned to you that, for our room systems, we consider the cost to be around $80,000, that's the figure we're using. Two-thirds of our equipment is the room systems that you saw demonstrated yesterday. In our room systems, we're going more and more to what V-tel, our supplier, calls FRED, a disgusting name—Friendly Rollabout Engineered for Doctors.

Having said that, the thing that is nice about FRED is that it makes things far more portable. The larger system weighs about 800 pounds and it's hard to move. The FRED weighs about 400 pounds; it's on large wheels, and we can move it from place to place. The screen is small, but if we were using it in a room like this, we would bring it in and jack it into this screen here. So if it's for teaching purposes, you use other monitors. If it's for use in the emergency department, and that's my focus, it works very well.

But we're moving very quickly to desktop equipment. By desktop, I mean a PC-based computer, with Windows '95, a single chip camera on top, out of the physician's offices, with ISDN lines to make it work.

The infrastructure is driving me crazy. We are using MEANS, Minnesota Equal Access Network, and US West as our carriers, and while they are helpful, they are not great. They're charging and arm and a leg, both of them, for T1 lines. I don't want to be in the telecommunications business. I want to be able to dial up broad band when I need it, and I think that's what you will see happen in the future. I don't know whether Dena and others agree with me, but I think we're moving in that direction. I think that the rates are going to continue to fall.

It fascinates me to see that, for the past eight or nine years now, all of the gas companies, natural gas companies, that I'm aware of, have been putting two things in the ground when they dig a trench. They've been putting gas pipe in the ground and they've been putting fiber optic cable right along with it. So your telephone service may soon be com-

ing from your friendly gas company. The point is that it's expensive to dig the trench, very cheap to put the cable in, and the more innovation, the better.

Someone talked about cable TV. There is huge band width there, but there are also issues of reliability and security. Overall though, I think the message is that it's coming. I watched a demonstration two weeks ago, by a company on the west coast called First Virtual, they're working with Picture-tel, and they are doing absolutely amazing things. I watched as I was sitting in Minneapolis and the speaker was in San Francisco. He had his laptop set up, and using the first virtual equipment, was communicating in real time, no delay. He was going *click* and we were interactive, *click* we were looking at a video clip, *click* we were retrieving files, *click* we watched President Clinton speaking at the University of Boston live. His comment at the time was, if you have to leave your desk to go upstairs in an elevator, not to mention your car, and certainly not in an airplane, to do business we're not using the technology appropriately. Business is moving at warp speed with this new technology. It's just a question of how quickly medicine keeps up with it.

I've pretty much covered infrastructure. It's going to change; I think you'll see more ISDN, more use of ATM, more compression, lower prices, things getting better and faster. I worry about our investment right now because the technology changes so quickly. The other cost is support. I mentioned $600,000 a year—that is not including the T1 lines. Whether my network continues to grow and whether it is perceived as successful will depend on the people that I have working in and serving the community. It's one thing to buy the hardware and put the network out there, but if that's the end of it, you're cooked. You have to be going back, training and retraining, holding hands, and using your interpersonal skills.

I have talked about the administrative savings in the time and travel we've cut down on. With education, instead of having a speaker go out to a small town to talk to three physicians, one of whom is sleeping, I have the speaker do it from their office and talk to seventy physicians in fifteen small towns. That, by the way, is sometimes called marketing, just in case you thought it was otherwise. I don't know how to measure, in education, the fact that I can now use rural speakers to speak and change the way they feel about themselves. I can change the image of the rural physician from the turkey who can't find first base, to somebody who is a very capable individual and can handle most things. That changes, I think, the way medical students feel about rural practice.

Radiology. We expect our radiologists to pay part of the T1 costs. After all, I'm a very nice guy and so is Allina, but why should we pay

$1400 a month to put a highway into the radiologist's office at Abbott Northwestern so that she can look at films and then send the bill out. So if our radiologists want to play, they'll pay.

Emergency medicine. Let me show you some of the numbers generated by our administrators. I've chosen two places that I want to talk about, one is Buffalo, Minnesota, and the other is Long Prairie, Minnesota. We made this slide to present at the American College of Emergency Physicians a while ago, so the numbers are not brand new, but it doesn't matter, the point is the same. Over a five-month period with telemedicine, the cost of delivering emergency medicine in Long Prairie by the administrators' measurement, was $81,000. In a comparable period without telemedicine, the cost was $129,000. That extrapolates to about $100,000 a year savings right now, and we have a signed contract with Long Prairie to deliver the emergency medicine.

There are a couple of things that are important for me to bring across to you. Buffalo Hospital gets paid five dollars an hour for covering the emergency department from 5:00 p.m. to 7:00 a.m. every night and all weekend. So Buffalo, one of our larger but still small emergency departments, staffed twenty-four hours, is making about $30,000 a year per site. They have three such sites on line every day, so they're making about $90,000 a year real money.

Long Prairie is also charging its T1 line to emergency medicine. They still get consultations, teleradiology, education, and administrative uses out of it, but the line is being charged to emergency medicine. We pay the local physicians about twice as much as we did before for backing us up. We can't do everything on telemedicine, but we can do a lot. That's where the savings for this hospital is, in bringing in local antennas and weekend coverage. Spectrum, Coastal, NES, the companies they were paying to come in and cover the emergency department are not doing it anymore. We also are adding $10,500 for Medicare right off the top that we don't get reimbursed for. So if we ever get reimbursed, the bottom line will look even better. The point is, without the reimbursement, the way it stands today there is $100,000 savings, and for Buffalo, the hub, there is an income of about $90,000.

The way that works is that from five o'clock on, the physician in Buffalo sees the patient via telemedicine in these small communities, examines them, does a history, does a physical examination, then has the staff nurse carry out the treatment: suture, splint, dealing with the nose bleed, dealing with epistaxis, and beginning therapy. We trained the nurses to do some things differently. The nurses love it, by the way. They have more responsibility, and they can act quickly. We're using

protocols, so they don't have to deal with grumpy physicians at three o'clock in the morning.

I have satisfaction data from patients, nurses, physicians, and on down the line. A rating of one means it stinks, four and five, motherhood and apple pie. This is all patient satisfaction data, and as you can see, it's all incredibly good.

I think one of the things that pleased me the most was talking to Paul VanGorp, a senior physician in Long Prairie, who was resistant to telemedicine when we put it in a year ago. I went out and had lunch with him and said, "Paul, we've been doing this for a year. Good, bad, indifferent, how would you rate it?" He said, "I guess I'll have to eat crow pie, it's good. I didn't think it was worthwhile, but my youngest partner would have left without it, and probably my second partner would have as well." And then he smiled and said, "I'm even starting to use it." Paul is my about my age, and is accustomed to going in to the emergency department and just staying there to see patients all Saturday morning. The two young physicians are not. But I took the remarks as a real compliment.

Some of the things that we're doing right now include starting to talk about triaging urban to rural. Mike works at the same hospital I do in St. Paul. Not infrequently there is a three-hour wait at five or six o'clock. Much of that lends itself to telemedicine. We are an integrated system, so when we have Michael running his tail off at United and we have another emergency medicine physician playing battleship bingo in Buffalo, why would we not triage the patient with the earache or simple things that we can move very quickly out to Buffalo, whether we get reimbursed or not? We'll more likely get reimbursed anyway because it is more likely that the city patient is a Medica patient, and we pay for Medica.

We're moving to desktop very quickly. And I'm out of time, but I want to tell you just a little about it. We're putting desktop in some of our cardiologists' offices. We're going to use ISDN lines in the city, and we're going to connect them with home patients, based on this.

One of the most common causes of death in this country is congestive heart failure. Cardiovascular deaths are the most common deaths, followed by malignancy. When you break down the cardiovascular deaths, if you're lucky you drop dead. If you're not lucky, you deteriorate slowly over a five-year period, and in the last two years, you average twenty hospitalizations a year, coming in to the hospital in acute pulmonary edema.

Michael or me or someone else, after you've had your $462 ambulance ride to Minneapolis, quickly spend $2500 to get you started

in the emergency department, and then take you up to our coronary care unit for a $7000 flash trip. Ten thousand dollars and three days later, we send you home only to have you back in ten days or two weeks for a repeat performance. Because there is no integrated record, and Michael saw you the first time and I see you the second time, I re-do all the things that he did two weeks ago.

It is estimated, and this is published data in the New England Journal, that with close follow-up, we could reduce those hospitalizations by fifty percent. Twenty hospitalizations at $10,000 per hospitalization is $200,000, reduced by fifty percent leaves $100,000. Why don't I go to the insurance company and say, "How would you like to save $50,000 a patient? I want you to pay for the lease of a PC and software in their home at $500 a month. I want you to pay for the medical peripherals at $100 a month to $600 a month, $7200 a year, the stuff only costs me $10,000. That, and I want you to pay for the physician's nurse and for the physician to see this patient daily."

I, as the physician, can say to the patient, "Hi, how are you? I want you to listen to your chest. Jugular venous pressure up. Has your weight changed?" I modify their medications and I keep them home half the time. Ten thousand dollars into the hardware and the ISDN line, $30,000 or $40,000 in fees for the physician and nurse, and I saved $50,000 on that patient. There are thousands of those patients in Minneapolis, St. Paul, and I don't know how many millions of them around the United States. Durkson said, "A billion here, a billion there, pretty soon you're talking real money."

Occupational medicine is the other thing that we're getting into it. A couple of our rural hospitals are setting up occupational medicine contracts between the emergency department and local industry. We'll do your occupational medicine without the patient leaving your building; we'll do their pre-employment physicals. Remember, if they come to the emergency department, they don't come by themselves; another employee drives them. If I can keep them in the building, I'm saving you money. So that's where we're going. The legal issue for us is, of course, waivers.

In the emergency medicine thing, we went to the State Board of Medical Practice, the State Board of Pharmacy, and the State Board of Nursing, and got waivers or their blessing for them. We have all of our physicians credentialed in each of the hospitals where they are practicing. Our malpractice has not changed; we self-insure for the first two million. Our attorneys did not see any risk and St. Paul Marine has a stock loss for us; likewise, they did not see an increased risk and our rate has not changed.

The licensure issue has been discussed at length. I would be an advocate of national licensure, which makes most of my colleagues choose to tar and feather me. Why we need local licensure, except to be restrictive and prohibitive, eludes me. We have had standards in our medical schools since the 1920s, that's not changed. We all write the same specialty examinations. What's the purpose, other than money and control at the state level. It ought to go national, but it won't in the near future.

Telemedicine is here to stay. It's going to increase in usage. Maybe not exactly the way we're seeing it now, but it's going to increase. And I think that if the tiny hospitals can't use this new form of technology, they're dead meat. They're going to have to use it or they're gone.

We're going desktop. You'll see better compression. I would hope that the networks are public utility. I don't want to own the network, I want to buy switched time. But the most important thing to me is that the costs are going down.

Reimbursement is also important. HCFA is worried about utilization. I know they're worried about quality, but they never worried about quality when we introduced angioplasty, MRIs, CT scans, and the like. It amazes me how we got worried about quality with telemedicine. Reimbursement is important, and I think HCFA will begin to pay eventually.

Problems. Nationally, I tried to do this locally, but they all come down to the same problems, the American Medical Association is edgy about this. All of the professional groups are edgy. HCFA is edgy. It's just tough to deal with. Locally, this issue becomes one of control, the issue becomes one of which hospital is going get this, which isn't, what department is going to get it. And people are either very much in favor of it or they tend to be opposed to it.

The other problem that has been discussed at length is the reimbursement issue. I would also argue that if you start a telemedicine program, you better make sure that you budget to adequately to sustain it. I would, again and again, say it's the people that make the difference. It's the interpersonal stuff, not the technology, that's going to drive the telemedicine network.

And finally, the problem which we had discussed adequately, I think, is the infrastructure question. Hopefully that's going to get better. Thank you.